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A Study To Assess The Risk Factors And Angiographic Profile Of Young Patients With Myocardial Infarction And Compare It With Older Patients Of Myocardial Infarction.

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Abstract

Background: Acute myocardial infarction (AMI) occurring at a young age is increasingly recognized as an important public health concern, particularly in developing countries. Young patients often exhibit distinct risk factor profiles and angiographic characteristics compared with older individuals. The present study was undertaken to assess the risk factors and angiographic profile of young patients with myocardial infarction and compare them with older patients. ***Materials and Methods:*** This hospital-based analytical cross-sectional observational study was conducted in the Department of Cardiology, Sri Aurobindo Medical College and Post Graduate Institute, Indore. A total of 100 patients with acute ST-elevation myocardial infarction were enrolled and categorized into two groups: <40 years (n=50) and ≥40 years (n=50). Clinical risk factors, Lipoprotein (a), high-sensitivity C-reactive protein (hsCRP), left ventricular ejection fraction (LVEF), angiographic findings, and recanalization outcomes following thrombolytic therapy were evaluated and compared. ***Results:*** Male sex (88.0% vs. 64.0%, p=0.005), smoking (78.0% vs. 42.0%, p<0.001), and obesity (54.0% vs. 20.0%, p<0.001) were significantly more common among younger patients, whereas diabetes mellitus was significantly more prevalent in older patients (54.0% vs. 20.0%, p<0.001). Younger patients demonstrated significantly higher Lipoprotein (a) (35.34±31.06 vs. 18.79±8.52 mg/dL, p<0.001) and hsCRP levels (34.34±42.49 vs. 9.17±13.99, p<0.001). Single-vessel disease predominated in younger patients (60.0%), while triple-vessel disease was more frequent among older patients (38.0%) (p=0.003). Successful recanalization following thrombolysis was significantly higher in younger patients (42.0% vs. 14.0%, p=0.002). ***Conclusion:*** Younger myocardial infarction patients exhibit a distinct profile characterized by smoking, obesity, elevated Lipoprotein(a), increased inflammatory burden, and predominantly single-vessel disease, whereas older patients demonstrate greater diabetes prevalence, multivessel coronary involvement, and poorer reperfusion outcomes. Early identification and aggressive modification of cardiovascular risk factors may improve outcomes and reduce the burden of premature coronary artery disease.

Keywords: Acute Myocardial Infarction; Coronary Artery Disease; Lipoprotein(a); hsCRP; Coronary Angiography.

INTRODUCTION

Coronary artery disease (CAD) remains the leading cause of cardiovascular morbidity and mortality worldwide and constitutes the principal pathological basis for acute myocardial infarction (AMI), one of the most serious manifestations of ischemic heart disease.[1,2] AMI results from a complex interplay of atherosclerotic plaque rupture or erosion, endothelial dysfunction, inflammation, and thrombotic occlusion of coronary arteries. Despite significant advances in pharmacological therapy, thrombolysis, and percutaneous coronary interventions, myocardial infarction continues to be associated with substantial mortality, long-term disability, and adverse cardiovascular outcomes.[3]

The burden of cardiovascular disease is particularly high in South Asian countries, including India, where rapid urbanization, changing lifestyle patterns, and increasing prevalence of cardiometabolic risk factors have contributed to a growing epidemic of CAD.[4] In India, cardiovascular diseases account for nearly one-fourth of all deaths, with ischemic heart disease representing the predominant contributor to premature mortality and years of life lost.[5,6] A distinctive feature of CAD in the Indian population is its earlier age of onset compared with Western populations, with the first myocardial infarction often occurring nearly a decade earlier.[7]

Recent epidemiological studies have highlighted an increasing incidence of myocardial infarction among young adults. Although myocardial infarction in individuals younger than 40 years constitutes a relatively small proportion of total cases, its clinical and socioeconomic implications are considerable because it affects individuals during their most productive years of life.[8,9] Young patients with AMI frequently exhibit a unique risk factor profile characterized by a higher prevalence of smoking, family history of premature CAD, dyslipidemia, elevated lipoprotein(a), inflammatory markers, and substance abuse, whereas traditional risk factors such as diabetes mellitus and hypertension are more commonly observed in older patients.[10,11]

The angiographic characteristics of CAD also differ according to age. Younger patients generally demonstrate less extensive atherosclerotic involvement, a higher prevalence of single-vessel disease, and thrombus-rich coronary lesions, while older patients more commonly present with diffuse multivessel disease and advanced coronary calcification.[12] Furthermore, left ventricular systolic function and the effectiveness of reperfusion therapy, including thrombolysis, may vary between age groups, thereby influencing prognosis and long-term outcomes.[13]

Despite the increasing recognition of premature myocardial infarction as a distinct clinical entity, comparative data regarding risk factors, angiographic patterns, left ventricular function, and recanalization rates between young and older patients remain limited in the Indian population.[14] Therefore, the present study was undertaken to evaluate and compare the clinical risk factors and angiographic profile of young patients (<40 years) with myocardial infarction and those of older patients (>40 years), with the objective of improving risk stratification, guiding therapeutic decision-making, and strengthening preventive strategies in this high-risk population.

MATERIALS AND METHODS

This hospital-based analytical cross-sectional observational study was conducted in the Department of Cardiology at Sri Aurobindo Medical College and Post Graduate Institute, Indore, to assess and compare the risk factors and angiographic profile of young and older patients presenting with acute ST-elevation myocardial infarction (STEMI). The study was carried out over a period of one year from August 2025 to July 2026 after obtaining approval from the Institutional Ethics Committee.

Consecutive patients diagnosed with acute STEMI and presenting within the thrombolysis window period were enrolled in the study. A total of 100 patients were included and categorized into two groups based on age: young myocardial infarction patients (<40 years) and older myocardial infarction patients (≥40 years). Written informed consent was obtained from all participants before enrolment, and the study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Inclusion Criteria

- Patients diagnosed with acute ST-elevation myocardial infarction within the thrombolysis window period.
- Patients aged ≥18 years of either gender.
- Patients willing to provide written informed consent.
- Patients eligible for thrombolytic therapy.

Exclusion Criteria

- Patients with non-ST elevation myocardial infarction (NSTEMI).
- Patients with stable or unstable angina.
- Previous history of coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI).
- Contraindications to thrombolytic therapy.
- Patients unwilling to participate in the study.

Methodology

A detailed clinical history was obtained from all participants with special emphasis on cardiovascular risk factors including smoking, diabetes mellitus, hypertension, family history of coronary artery disease, and substance abuse. Baseline demographic characteristics, clinical presentation, and vital parameters were recorded. Comprehensive general physical and cardiovascular examinations were performed.

All patients underwent routine laboratory investigations including complete blood count, liver function tests, renal function tests, glycated hemoglobin (HbA1c), and lipid profile. In addition, serum high-sensitivity C-reactive protein (hsCRP) and lipoprotein(a) [Lp(a)] levels were measured to assess emerging cardiovascular risk factors. Cardiac biomarkers including Troponin I, Troponin T, and creatine phosphokinase-MB (CPK-MB) were estimated for confirmation of myocardial infarction.

A standard 12-lead electrocardiogram (ECG) was performed at presentation and during hospitalization to document infarct location and ST-segment changes. Two-dimensional transthoracic echocardiography was carried out in all patients for assessment of left ventricular systolic function, and left ventricular ejection fraction (LVEF) was calculated using standard methods. Regional wall motion abnormalities were also documented.

Coronary angiography was performed according to institutional protocol. Angiographic parameters evaluated included the number of vessels involved, site of coronary artery occlusion, severity of stenosis, lesion characteristics, and presence of collateral circulation. Eligible patients received thrombolytic therapy within the recommended therapeutic window. Recanalization following thrombolysis was assessed using clinical improvement, resolution of ST-segment elevation on ECG, and angiographic evidence of coronary reperfusion.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation, whereas categorical variables were presented as frequencies and percentages. Comparisons between young and older myocardial infarction patients were performed using the independent Student's t-test or Mann–Whitney U test for continuous variables and Chi-square test or Fisher's exact test for categorical variables, as appropriate. Correlations between quantitative variables were assessed using Pearson's or Spearman's correlation coefficient. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 100 patients with acute ST-elevation myocardial infarction (STEMI) were included in the study. The study population was equally divided into two groups comprising 50 patients aged less than 40 years and 50 patients aged 40 years or above. Demographic characteristics, cardiovascular risk factors, biochemical markers, angiographic findings, left ventricular systolic function, and recanalization outcomes were compared between the two groups.

The study population consisted predominantly of males (76.0%), with females accounting for 24.0% of participants. Anterior wall myocardial infarction (AWMI) was the most common presentation (59.0%), followed by inferior wall myocardial infarction (37.0%) and posterior wall myocardial infarction (4.0%). Smoking was the most prevalent cardiovascular risk factor (60.0%), followed by hypertension (48.0%), hyperlipidemia (42.0%), diabetes mellitus (37.0%), and obesity (37.0%). Single-vessel disease was the most frequent angiographic finding (45.0%), while successful recanalization following thrombolysis was observed in only 28.0% of patients. [Table 1]

Table 1: Baseline Characteristics of the Study Population (N=100)

Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	76	76.0
	Female	24	24.0
Myocardial Infarction Type	AWMI	59	59.0
	IWMI	37	37.0
	PWMI	4	4.0
Risk Factors	Smoking	60	60.0
	Hypertension	48	48.0
	Hyperlipidemia	42	42.0
	Diabetes Mellitus	37	37.0
	Obesity	37	37.0
Coronary Artery Disease Pattern	Single Vessel Disease	45	45.0
	Double Vessel Disease	30	30.0
	Triple Vessel Disease	25	25.0
Recanalization After Thrombolysis	Success	28	28.0
	Failure	72	72.0

Male predominance was significantly higher among younger patients than older patients (88.0% vs. 64.0%, p=0.005). Smoking was significantly more prevalent in younger patients (78.0% vs. 42.0%, p<0.001), whereas diabetes mellitus was significantly more common among older patients (54.0% vs. 20.0%, p<0.001). Obesity was also significantly more prevalent among younger patients (54.0% vs. 20.0%, p<0.001). No statistically significant differences were observed regarding hypertension, hyperlipidemia, or myocardial infarction type. [Table 2]

Table 2: Comparison of Demographic Characteristics, MI Type and Cardiovascular Risk Factors Between Young (<40 Years) and Older (≥40 Years) Patients with Myocardial Infarction

Variable	Category	<40 Years (n=50)	≥40 Years (n=50)	Total (N=100)	p-value
Sex	Male	44 (88.0%)	32 (64.0%)	76 (76.0%)	0.005*
	Female	6 (12.0%)	18 (36.0%)	24 (24.0%)	
MI Type	AWMI	35 (70.0%)	24 (48.0%)	59 (59.0%)	0.073
	IWMI	14 (28.0%)	23 (46.0%)	37 (37.0%)	
	PWMI	1 (2.0%)	3 (6.0%)	4 (4.0%)	
Smoking	Yes	39 (78.0%)	21 (42.0%)	60 (60.0%)	<0.001*
	No	11 (22.0%)	29 (58.0%)	40 (40.0%)	
Hyperlipidemia	Yes	23 (46.0%)	19 (38.0%)	42 (42.0%)	0.418
	No	27 (54.0%)	31 (62.0%)	58 (58.0%)	
Diabetes Mellitus	Yes	10 (20.0%)	27 (54.0%)	37 (37.0%)	<0.001*
	No	40 (80.0%)	23 (46.0%)	63 (63.0%)	
Hypertension	Yes	21 (42.0%)	27 (54.0%)	48 (48.0%)	0.230
	No	29 (58.0%)	23 (46.0%)	52 (52.0%)	
Obesity	Yes	27 (54.0%)	10 (20.0%)	37 (37.0%)	<0.001*
	No	23 (46.0%)	40 (80.0%)	63 (63.0%)	

*Statistically significant ($p<0.05$)

Comparison of mean left ventricular ejection fraction (LVEF), Lipoprotein(a) [Lp(a)], and high-sensitivity C-reactive protein (hsCRP) between young and older myocardial infarction patients revealed significant differences in inflammatory and atherogenic biomarkers but not in left ventricular systolic function. The mean LVEF was slightly lower in younger patients (38.14 ± 7.77%) compared with older patients (40.30 ± 9.55%); however, this difference was not statistically significant (p=0.218). In contrast, younger patients demonstrated significantly higher mean Lipoprotein(a) levels (35.34 ± 31.06 mg/dL vs. 18.79 ± 8.52 mg/dL; p<0.001) and significantly elevated hsCRP levels (34.34 ± 42.49 vs. 9.17 ± 13.99; p<0.001). [Table 3]

Table 3: Comparison of Mean Values Between Two Study Groups

Parameters	Group	N	Mean	Std. Deviation	t-test	p-value	Result
LVEF (%)	<40 Years	50	38.14	7.77	-1.241	0.218	Non-Sig
	≥40 Years	50	40.30	9.55			
Lipoprotein(a) (mg/dL)	<40 Years	50	35.34	31.06	3.634	<0.001	Sig
	≥40 Years	50	18.79	8.52			
hsCRP	<40 Years	50	34.34	42.49	3.974	<0.001	Sig
	≥40 Years	50	9.17	13.99			

Angiographic evaluation demonstrated significant age-related differences in coronary artery disease burden. Single-vessel disease predominated among younger patients (60.0%), whereas triple-vessel disease was significantly more common among older patients (38.0%) (p=0.003). LCX involvement was significantly higher in older patients (68.0% vs. 34.0%, p=0.001). No statistically significant differences were observed in LAD, RCA, or LMCA involvement between the groups. [Table 4]

Table 4: Comparison of Angiographic Characteristics Between Two Study Groups

Variable	Category	<40 Years (n=50)	≥40 Years (n=50)	Total	p-value
Disease Group	Single Vessel Disease	30 (60.0%)	15 (30.0%)	45 (45.0%)	0.003*
	Double Vessel Disease	14 (28.0%)	16 (32.0%)	30 (30.0%)	
	Triple Vessel Disease	6 (12.0%)	19 (38.0%)	25 (25.0%)	
LAD	Abnormal	41 (82.0%)	43 (86.0%)	84 (84.0%)	0.585
	Normal	9 (18.0%)	7 (14.0%)	16 (16.0%)	
LCX	Abnormal	17 (34.0%)	34 (68.0%)	51 (51.0%)	0.001*
	Normal	33 (66.0%)	16 (32.0%)	49 (49.0%)	
RCA	Abnormal	26 (52.0%)	35 (70.0%)	61 (61.0%)	0.065
	Normal	24 (48.0%)	15 (30.0%)	39 (39.0%)	
LMCA	Abnormal	3 (6.0%)	5 (10.0%)	8 (8.0%)	0.461
	Normal	47 (94.0%)	45 (90.0%)	92 (92.0%)	

*Statistically significant (p<0.05)

Recanalization outcome following thrombolytic therapy showed a significant association with age group (p=0.002). Successful reperfusion was achieved in 42.0% of younger patients compared with only 14.0% of older patients. Conversely, thrombolytic failure was substantially higher among older patients (86.0%) than younger patients (58.0%). These findings suggest that younger myocardial infarction patients experienced better reperfusion outcomes following thrombolytic therapy than older patients. [Table 5]

Table 5: Comparison of Recanalization Outcome After Thrombolysis Between Two Study Groups

Recanalization After Thrombolysis	<40 Years (n=50)	≥40 Years (n=50)	Total (N=100)	p-value
Failure	29 (58.0%)	43 (86.0%)	72 (72.0%)	0.002*
Success	21 (42.0%)	7 (14.0%)	28 (28.0%)	
Total	50 (100.0%)	50 (100.0%)	100 (100.0%)	

*Statistically significant (p<0.05)

Among patients aged less than 40 years, none of the evaluated cardiovascular risk factors showed a statistically significant association with successful recanalization following thrombolytic therapy (all p>0.05). Although recanalization success was numerically higher among obese and smoking patients, these differences did not reach statistical significance. Similarly, hyperlipidemia, diabetes mellitus, and hypertension showed no significant influence on thrombolytic reperfusion outcomes in younger myocardial infarction patients.

Table 6: Association of Major Cardiovascular Risk Factors with Recanalization After Thrombolysis in Patients <40 Years

Risk Factor	Category	Failure (n=29)	Success (n=21)	p-value
Obesity	No	15 (51.7%)	8 (38.1%)	0.340
	Yes	14 (48.3%)	13 (61.9%)	
Smoking	No	8 (27.6%)	3 (14.3%)	0.262
	Yes	21 (72.4%)	18 (85.7%)	
Hyperlipidemia	No	16 (55.2%)	11 (52.4%)	0.845
	Yes	13 (44.8%)	10 (47.6%)	
Diabetes Mellitus	No	24 (82.8%)	16 (76.2%)	0.567
	Yes	5 (17.2%)	5 (23.8%)	
Hypertension	No	17 (58.6%)	12 (57.1%)	0.917
	Yes	12 (41.4%)	9 (42.9%)	

Among patients aged 40 years and above, none of the evaluated cardiovascular risk factors demonstrated a statistically significant association with successful recanalization following thrombolytic therapy (all p>0.05). Although obesity and diabetes mellitus were numerically more common among patients with failed reperfusion, these associations did not achieve statistical significance.

Table 7: Association of Major Cardiovascular Risk Factors with Recanalization After Thrombolysis in Patients ≥40 Years

Risk Factor	Category	Failure (n=43)	Success (n=7)	p-value
Obesity	No	33 (76.7%)	7 (100.0%)	0.154
	Yes	10 (23.3%)	0 (0.0%)	
Smoking	No	24 (55.8%)	5 (71.4%)	0.438
	Yes	19 (44.2%)	2 (28.6%)	
Hyperlipidemia	No	26 (60.5%)	5 (71.4%)	0.579
	Yes	17 (39.5%)	2 (28.6%)	
Diabetes Mellitus	No	18 (41.9%)	5 (71.4%)	0.145
	Yes	25 (58.1%)	2 (28.6%)	
Hypertension	No	20 (46.5%)	3 (42.9%)	0.857
	Yes	23 (53.5%)	4 (57.1%)	

Overall, younger myocardial infarction patients were characterized by a higher prevalence of smoking, obesity, elevated Lipoprotein(a), and increased inflammatory burden, whereas older patients demonstrated a greater prevalence of diabetes mellitus, more extensive multivessel coronary artery disease, and significantly lower rates of successful recanalization

following thrombolytic therapy. These findings highlight important age-related differences in risk factor profile, angiographic characteristics, and reperfusion outcomes.

DISCUSSION

The present study evaluated the risk factor profile, angiographic characteristics, biochemical markers, left ventricular systolic function, and thrombolysis outcomes among young (<40 years) and older (≥40 years) patients presenting with acute ST-elevation myocardial infarction (STEMI). The findings demonstrated significant age-related differences in cardiovascular risk factors, inflammatory biomarkers, coronary artery disease burden, and recanalization outcomes.

A marked male predominance was observed in the study population, with males accounting for 76% of all cases. Younger patients showed significantly higher male representation compared to older patients (88% vs. 64%, p=0.005). Similar observations have been reported by Jamil et al. [16], Shah et al. [16], Matsis et al. [17], and Alexander et al. [18], who documented a predominance of males among young myocardial infarction patients. This pattern may be attributed to greater exposure to smoking, obesity, occupational stress, and lifestyle-related cardiovascular risk factors among men, along with the protective effects of estrogen in premenopausal women.

Anterior wall myocardial infarction was the most common presentation in the present study (59%), consistent with findings reported by Sricharan et al. [19], Kumbhalkar et al. [20], and Kumar et al. [21]. Although AWMI was more frequent among younger patients, the difference between age groups was not statistically significant. The predominance of AWMI may be explained by the frequent involvement of the left anterior descending artery, which supplies a substantial portion of the left ventricular myocardium.

Among conventional cardiovascular risk factors, smoking emerged as the most prevalent determinant and demonstrated a significant association with younger age (78% vs. 42%, p<0.001). Similar findings have been reported by Islam et al. [22], Shah et al. [16], Mahmud et al. [23], and Mukhopadhyay et al. [24]. Smoking contributes to endothelial dysfunction, platelet activation, oxidative stress, and thrombogenesis, thereby accelerating atherosclerotic disease and promoting premature myocardial infarction. Obesity was also significantly more common among younger patients (54% vs. 20%, p<0.001), in agreement with observations by Matsis et al. [17] and Mahmud et al. [23]. In contrast, diabetes mellitus was significantly more prevalent among older patients (54% vs. 20%, p<0.001), supporting findings reported by Islam et al. [22], Alexander et al. [18], and Mahmud et al. [23]. These findings suggest that lifestyle-related risk factors predominate in younger individuals, whereas metabolic disorders become increasingly important with advancing age.

The present study demonstrated significantly higher Lipoprotein(a) and hsCRP levels among younger patients. Elevated Lipoprotein(a) has been recognized as an independent risk factor for premature coronary artery disease, while increased hsCRP reflects enhanced inflammatory activity and plaque instability. Similar associations have been reported by Kumar et al. [21], Kumbhalkar et al. [20], and Sagris et al. [1]. These findings support the growing evidence that inflammatory and genetic factors play an important role in the pathogenesis of premature myocardial infarction.

Angiographic evaluation revealed important differences between the two age groups. Single-vessel disease predominated among younger patients (60%), whereas triple-vessel disease was significantly more common among older patients (38%, p=0.003). These observations are consistent with studies by Sricharan et al. [19], Tamrakar et al. [25], Kumar et al. [21], Islam et al. [22], and Shah et al. [16]. The limited coronary involvement among younger patients may reflect shorter cumulative exposure to atherosclerotic risk factors, whereas older patients develop more diffuse and advanced coronary artery disease over time. Furthermore, LCX involvement was significantly greater among older patients (68% vs. 34%, p=0.001), indicating more extensive coronary pathology in this group.

No significant difference in left ventricular ejection fraction was observed between younger and older patients, suggesting that age alone may not significantly influence early systolic dysfunction following acute myocardial infarction. However, despite similar LVEF values, older patients demonstrated more extensive coronary artery disease and poorer reperfusion outcomes.

One of the most important findings of the present study was the significantly higher rate of successful recanalization following thrombolysis among younger patients (42% vs. 14%, p=0.002). Similar favorable outcomes in younger myocardial infarction patients have been reported by Tahri Idrissi Hassani et al. [26], Alexander et al. [18], and Murat et al. [27]. Better thrombolysis outcomes among younger individuals may be attributed to lower atherosclerotic burden, greater prevalence of single-vessel disease, less vascular calcification, preserved endothelial function, and improved microvascular integrity. In contrast, older patients often exhibit diffuse multivessel disease and complex coronary lesions that may reduce thrombolytic efficacy.

Interestingly, none of the conventional cardiovascular risk factors, including smoking, obesity, diabetes mellitus, hypertension, and hyperlipidemia, demonstrated a significant association with recanalization success within either age group. This suggests that factors such as thrombus characteristics, plaque morphology, duration of ischemia, and underlying coronary anatomy may exert a greater influence on thrombolytic reperfusion than traditional risk factors alone.

Overall, the present study demonstrates that young myocardial infarction patients possess a distinct clinical profile characterized by male predominance, smoking, obesity, elevated Lipoprotein(a), increased inflammatory burden, and predominantly single-vessel coronary artery disease. Older patients, in contrast, exhibit a greater prevalence of diabetes mellitus, more extensive multivessel involvement, and poorer thrombolytic reperfusion outcomes. These findings highlight the importance of early identification of modifiable risk factors, aggressive preventive strategies, and age-specific management approaches to reduce the burden of premature coronary artery disease and improve cardiovascular outcomes. Despite yielding clinically relevant findings, the study was limited by its single-center design, small sample size, cross-sectional nature, and lack of long-term follow-up and assessment of genetic and lifestyle factors.

CONCLUSION

Acute myocardial infarction in younger individuals represents a distinct clinical entity characterized by a predominance of modifiable lifestyle-related risk factors, heightened inflammatory activity, and a more favorable angiographic profile compared with older patients. Smoking, obesity, elevated Lipoprotein(a), and increased hsCRP levels emerged as important contributors to premature coronary artery disease, whereas diabetes mellitus and extensive multivessel involvement were more frequently encountered in older patients. Younger patients predominantly exhibited single-vessel disease and achieved significantly higher rates of successful recanalization following thrombolytic therapy despite having comparable left ventricular systolic function. These findings underscore the evolving burden of premature myocardial infarction and highlight the need for early cardiovascular risk assessment, aggressive risk-factor modification, and targeted preventive strategies. Incorporation of novel biomarkers such as Lipoprotein(a) and hsCRP into routine risk stratification may facilitate earlier identification of high-risk individuals and contribute to improved cardiovascular outcomes.

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